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NORTH AMERICAN RESPONSIBILITIES FOR THE UNIVERSITY, 1934–1954[1]

By Dr. ALAN GREGG

THE ROCKEFELLER FOUNDATION

FOR the past sixteen years I have had occasion to visit medical schools and institutes of medical research in some thirty countries. In the variety one encounters in such an experience—variety of methods, of purposes and of circumstances—one is reminded of a saying of Oscar Wilde: "When you break the little laws the big laws begin to operate," for out of so many contradictions and differing practices emerge certain underlying principles. I can not forget the first time I saw an Irish jaunting car. My impression was that if that was a vehicle then one could design almost anything for transportation purposes and it might work, for if one sees underlying principles in a great variety of forms the end result is a great sense of freedom to tackle almost any new task.

Now, one question which I should like to ask you this evening is this: Are we prepared here in North America to assume responsibility for the maintenance and continuation of one of the greatest traditions of Western Europe, the university? Everywhere I have gone and seen institutions of higher learning there are traces of that tradition—sometimes strong, sometimes weak, but there is no doubt that in the world of teaching and of scholarship the university as it has developed in Western Europe is the source and the paradigm. How much do we understand of this tradition? If we accept Hegel's definition of freedom as "the recognition of necessity" then are we

[1] Presented at the annual banquet of the Federation of Societies for Experimental Biology, Toronto, April 28, 1939.

free to select the best there is in the university tradition and cherish it?

Of the Tercentenary of Harvard a curious and arresting story is told—as I happen to know quite accurately. In three separate instances European delegates to the Tercentenary remarked privately to their friends: "I came to this celebration with a heavy heart. Our priceless heritage, the university, is in the gravest peril in Europe. But what I have seen here gives me hope again, for I have seen that it can go on in North America." To match this faith, to justify this hope, let us ask ourselves this question, "Are we fully prepared to carry on if need be?" For that may be our greatest task in the next twenty years.

It would be a waste of time to try to appraise the universities in Europe or to attempt to judge their merits compared with our own. Many years ago a student in the Andover Theological Seminary who had fallen in love in the second year found himself but ill prepared for the examination in hagiology. The question posed in the examination was, "Name and describe five of the minor prophets." After much biting of his pencil he wrote: "God forbid that I should discriminate between these pious and holy men." So I shall attempt rather to offer you some of the convictions my years abroad provided regarding phases of European university life which I do not see well developed, nor in some cases indeed even recognized on this side of the Atlantic. Let me speak of things I fear may be lost or weakened and urge you to think of others needed if we are to justify the hope that is placed in us.

Before 1914 we in North America regarded the universities in Europe with earnest respect. Indeed there was admiration—implicit or explicit—and the flattery of imitation. Many of our superior students sought and found in Europe intellectual habit—personal independence, intellectual method—thoroughness and the conviction that there was an opportunity for each to add to the scholarships of the world. Relationships almost filial in their devotion grew up between great teachers and eager Canadian and American disciples. And of peculiar importance and value there spread over Canadian and American university life that wonderful open-mindedness and unselfconscious receptivity which always characterizes ingenuous humility and true modesty. We weren't ashamed to learn nor afraid to try. We had no false pride or narrow loyalties. But our contacts were in the main personal, our admirations individual and the models chosen were from varying systems of university life. It was only rarely that an American or Canadian student was taken into the very heart of institutional guidance and policy-making, there to remain long enough to understand fully the nature of the university as an institution. Such experience on the inside of institutional policy and guidance would have imparted certain values to the younger men—such values as might be worth striving for in the universities in the New World to which they were to return.

From 1914 to 1934 circumstances and attitude have changed. The flow of graduate students to Europe has much diminished where it has not ceased. Europe has had less comparatively to offer: its university facilities often seem niggardly, its professors overloaded and preoccupied and impoverished. Confidence and leadership are not in the air, though the capacity for work and the cultural baggage of the European professor continue to impress the North American visitor. On this side of the Atlantic university buildings, facilities, endowments and teaching loads have increased. We have made some substantial additions to the world's store of knowledge. With one such signal contribution this city—Toronto—is associated. Thus the stage is set for the false conclusion to emerge that Europe can mean but little more to us. Is this the wisest mood?

In this matter of cultural transfer one needs a word which means to translate the function as contrasted with imitate the form. To copy, or to pattern after, or to imitate, all connote attention to form. What is needed is a word that means to secure the transfer of a function not the carrying over of a form. And this is needed to help to make clear this point: It is some of the functions of the European university we could well be taking over, whereas it might be either futile or disastrous to take over their forms. But you are to be spared a new word, for we should be passing now to the consideration of what seems to be lacking in the apparent completeness of the transfer of the functions of the European university to the North American scene. And I must add in these remarks, I am not a xenophile. The word, like the sentiment, is rare these days. I don't wish to seem to belittle what we have nor imply that what is remote is better than what is at hand. But the fact is that the functions discharged by the European universities have shown impressive vitality. They are worth study, and besides that they are our heritage. I want rather to draw attention to what has been called the technique of rejuvenation—to fit functions seen operating elsewhere to our own conditions on this side of the water.

Of all that is worth attention in the European universities, we may have accepted only a part, and of what we have accepted only a part in turn may survive. The better to understand these possible losses it may be well first to examine aspects of the local scene which bear upon our capacity to assimilate and to maintain the functions of the university as it has evolved in the area of its origin.

Higher education in North America has grown in an environment peculiar and in two points at variance with the European milieu. I should suppose that we live in the largest area of homogeneous culture in the

world. Wide circulation of books, newspapers, moving pictures, the radio and easy travel reinforce this homogeneity.

When I was in our Paris office friends arriving from America would ask, "Well, how are things in Europe?" Now that is an impossible question, for Europe is too different to be reported upon in its totality, and yet the question indicated the unconscious assumption that any one might have coming from North America that statements could be made for Europe in general as they can for North America. You will recall the French lecturer who, after a whirlwind trip of the United States in which he met many friends and contemporaries, sank exhausted in his cabin of the boat taking him back to Paris, surrounded by twenty-two books sent him by his American friends to read on the voyage home. When the covers were off the books he discovered that seventeen out of the twenty-two were identical copies of the book recommended at that time by the Book-of-the-Month Club.

But this amazing homogeneity results in a kind of self-assured insularity, for there is real difficulty in finding able outsiders or distinguished critics or other persons proceeding from totally different axioms to challenge our uniform conclusions or throw our major assumptions into doubt. By as much as we are so large and so homogeneous our obvious differences are more superficial than they seem. This similarity of view in one area after another is simply not to be found in Europe, and it can hardly be questioned that homogeneity disposes more to emotional belief than reasoned certitude, since those contrasts and contradictions are lacking which arrest the attention and demand explanation and choice.

Furthermore, it may be of value to note that the position of the intellectual in Europe may be affected by the fact that in every European capital there is a great if not the greatest university in the country. In America, in Canada and in Australia the political capital is not the place of a great university nor a center of affairs. And the only partial variant from this observation—London—is easily reached by men from Oxford or Cambridge. And thus American and Canadian universities have grown up without as easy and as close a contact with political and financial leaderships as is characteristic on the European continent. Are there not peculiar risks in such isolation—as well as some advantages?

Another characteristic in the North American scene: Underlying higher education here we have forms of secondary education which prepare our students for advanced work in the universities less adequately than their analogies in Europe. For their objectives and for society generally our secondary schools may do a passable job, but for the purposes of the university the secondary schools in America leave much to be desired.

I have often wondered why this is the case. One of the reasons must be the relative absence of family ambition and pressure upon young people of the secondary school age. I remember on the suburban train out from Paris I used to see a French father and his son of thirteen or fourteen who used that precious twenty-five minutes in a regular and earnest lesson in English. Later in a similar commuter's train out of New York I saw one time a similar father and son, and this time the father was reading the stock reports and the boy was reading the "Funnies." I commented upon this contrast to a neighbor of mine that very day, and he looked gravely disapproving and said: "Oh, I don't believe in that; that's not what I would have done; I believe in being a companion to my boy and I would have been reading the 'Funnies' with him."

Historically, our universities grew out of the colleges. The colleges were in the main sectarian enterprises to produce teachers and preachers. There was more pressure for the graduates, teachers and preachers to be numerous than to be excellent, and this pressure had also a flavor of sectarian competition, and so grew up the tradition that the college professor's moral and religious duty was to *teach,* and this well-nigh to the exclusion of scholarship and participation in self-government or associate living. In some of the colleges to-day there is a measure of sectarian stubbornness, narrowness and pretension which knows no better standard for self-comparison than the record of some nearby rival.

Add to this preoccupation with the teaching load the aura of political and social approval expressed in the phrase "equality of opportunity" and the staggering mass of poorly prepared students which have been crowding the colleges and universities and you have a dilution of scholarship which is no better than oedema. It will "pit on pressure." As in planting trees too close together, the *equality* of opportunity is not as important as the nature of the opportunity and relief from unreasonable circumstances. It is not the equality but the quality of opportunity that counts. Our universities have accepted so huge a burden of teaching that there is a serious discrepancy in many institutions between the tacit understandings on the campus and the explicit claims and purposes in the catalogues.

There is a better test than numbers, than equality of opportunity, than the moral duty of teaching. We should rather judge a university or indeed any form of human association by what kind of a life it permits, encourages and rewards. I submit that all the colleges and all too many of the universities reward the close following of orders and the hard study of assigned work. Before I went to medical school I went down

to Johns Hopkins to look around and decide whether I should go there. Quite by chance while I was strolling through the anatomy building one of the teachers stopped me and engaged in what seemed to me a perfectly delightful twenty minutes conversation on the business of being a medical student. I found out later that I had talked with Franklin P. Mall. Just after that conversation I saw in the street a student I had known when we were together at a boys' camp. I taxed him for information about Hopkins. "Oh, it's wonderful," he said, "and what teachers—Welch, Howell, Abel, . . ." And then he added suddenly: "All except one, . . ." "Is that so," I replied, "and who is he?" "Oh, his name is Mall," my young friend replied. "Do you know what he did the very first day in Anatomy? He said, 'Gentlemen, the dissecting rooms are open from nine in the morning till ten at night; I can recommend the three following text-books; there will always be some one there to help you if you get stuck, and when you are ready to take the examination let us know.' Now," continued my young friend, "If you can beat that for a ——— of laziness, you're going some." There was a lad who had done well in a system of close following of orders and hard study of assigned work, but completely at sea when the strategy of his existence was placed on his own shoulders. Strategy is the art of knowing when and on what conditions you will engage your strength. Our college students get too little of it. Their life is one of tactics, and tactics of course is simply the skill, the economy and the grace with which you employ your force when the strategical question is settled. Our secondary schools and our colleges produce a fair tactical product, but our students are immature in questions of strategy, and I would rest my case in this claim by pointing out the existence in many a university catalogue of one phrase, disastrous or funny as you choose, *"obligatory electives."*

Moreover, in our schools and colleges learning by symbols—the spoken and the written word—is encouraged. Its importance is exaggerated because there is another kind of learning, namely, learning by experience. My dogs have no symbols, and yet it is stupid to think they don't know me. Perhaps the unit of this learning by experience is the conditioned reflex, but the summation of these reflexes, experience, is of greater importance than the intellectuals realize. Knowledge from experience gives skill; it gives joy, and it gives courage. Courage may be the thing most required of universities in these next twenty years.

And lastly we are flooded by students, by poorly prepared students. We encourage them by our methods, and our tradition of being teachers foremost has accustomed us to being preoccupied with what we are really giving the students. We are sentimental about it. We give till it hurts—till it hurts the student. Let me read from a letter of a college president I received not long ago: "We are trying to work out therefore the implications of an educational philosophy which places the focus of interest in what is actually happening in and to the minds of individual students on our particular campus." Now, my comment would be that instead of having the teacher's attention on what is going on in the student's mind, why not in the maturer stages of education have the student's attention on what is going on in the teacher's mind? One important qualification to this general statement that we are flooded with students should be made in connection with the medical schools, since the medical schools in North America have sharply limited the number of students admitted. They have limited student numbers not on the basis of teaching by symbols—lectures and reading—but on the basis of the opportunities that can be given their students for experience and learning by experience in laboratories and clinics.

Now may I touch upon what European experience has taught me to want to see more of over here?

First of all, we should be more preoccupied with the social and intellectual climate created by the university—a social and intellectual climate in which the creative powers of scholars will flourish. The Scandinavians, when they build a laboratory, provide specifically a room or two for the emeritus professor. What a wise understanding of what retirement could mean! I do not retire my friends at 65, nor does the counsel and contact with men above that age cease to be valuable to me. There should be more appreciation of the concept of the university as a place where any person's genius for the scholarly life is cherished. The system of dining in hall in the English university has something we can't capture in hurried cafeteria lunches at the Faculty Club. There is a leisureliness and an equality among fellows dining in hall which enables them to estimate and experience each other as human beings. That is precious. How soon will we realize that we could pay more attention to each other and thus to the example we set our students? I remember a clinic that I attended given by Widal. First the student presented the case, haltingly and inaccurately, but nonetheless a fair performance in the light of his immaturity. Then the interne presented the same case with improvements in the information selected, in its fullness and in its accuracy. And then Widal's assistant amplified, refined and corrected the information and placed that particular case of bronchiectasis in a clear and entirely satisfactory light. But then the master, Widal, beginning with the anatomy, the physiology, the bacteriology and the pathology of bronchiectasis, chose just the significant facts from the previous statements and went on to

the differential diagnosis, to the nosology of the disease and prognosis and to the indications of where further knowledge is needed. As exposition perhaps it was laborious, repetitive and cumbersome, this turning of four individuals on the same material, but as an example of mastery of subject it was magnificent and not the mastery of a sudden absolute perfection, but, as it were, a graduated mastery, an eminence attainable to any one whose eyes and efforts were turned upward. Perhaps it is this neglect of example that is responsible for the remark of a European professor on returning from a visit to America: "I have never heard from university colleagues so much talk about education and so little about scholarly problems." Now I should expect that perhaps one quarter of the Ph.D.'s in the United States make any subsequent contribution that equals their thesis. That is a serious situation. Our product could well be the quality of our lives together and not merely the qualifications of our graduates to leave us.

It is so strongly in our social tradition to be alert to the encroachments of the few upon the mass that we ignore the depredations of the mass upon an élite. It is almost too delicate a situation to speak of an élite, but I simply mean by that word that rather limited number of men in universities who may wisely be assumed to be their own best taskmasters. I once asked Owen Lattimore what was the Samurai's code. He replied that there was no code, exactly speaking: only this, that a member of the Samurai realizes that whatever he does *is* the standard of behavior for all classes in Japan. The élite exists when capacity, freedom and responsibility are welded together.

The word "freedom" raises many a resonance in university life. One of the shrewdest remarks on that subject is the story of that extraordinary English woman, Gertrude Bell, who knew Arabia so thoroughly that during the Great War she became an emissary of the British Government to various Arab chieftains. To one such she outlined an arrangement, saying something like this: "If you will do so-and-so and so-and-so, the Government will give you full liberty." The Arab chief drew himself up, regarded her with dignity and said: "Madam, may I remind you that liberty is always taken and never given?" It seems to me that if we approach the question of freedom from the point of view of what can be done to secure it our attention can best be devoted to producing an atmosphere of equality.

Equality is the best condition for securing freedom, and whatever helps to make your colleague feel himself your equal is precious to him and to you and to the life of the university. The judicial mind, self-criticism, the readiness to discuss and dispute without dogmatism —and then tolerance, dignity and fair play—all these are exquisitely desirable in order that freedom and variety be given a chance to prove their value. Such a theory of the élite and of equality can be conveyed only by example and experience—lectures, books, exhortations and speeches (including this one) are quite useless. Sometimes I think that our architects should carve above academic entrances a symbol too often forgotten, the mythical animal of the Middle Ages—"the Toad that bears a jewel in his head"—for too often our attitude is captious and picayune; we want perfection in every colleague.

Now I miss the Old World's interest in quality—and their grave expectations of what an élite may be relied upon to do. We speak of graduated thermometers and graduated students—but our graduates are not graduated finely enough. We have been so preoccupied by tending them day by day that no stiff stern measure is set against their performance. We take, compared with Europeans, a motherly interest in their difficulties instead of a fatherly interest in their trials of strength. We reward the élite with distrust and a heavy routine instead of with freedom, expectation and responsibility. Not very long ago a French scholar with no university connections wrote three excellent books in the field of medieval history. In recognition of his ability he was offered a professorship at the Collège de France. He accepted. In late October he called upon a colleague in the Collège to learn a little more of what might be expected of him. After an hour of inconsequential talk he got down to his main inquiry. "Tell me," he said, "what are my duties at the Collège de France?" The reply was, "Ask the janitor. He knows when the rooms are heated, lighted and available. For it is the tradition at the Collège de France to select persons who know how to lead in their fields better than any one else can tell them, and we leave that problem to the men to solve as they see fit."

Now such confidence in superior human beings involves a respect for the individual and a naturalism that are remote from the hire-and-fire atmosphere pervading the college and many a university preoccupied with teaching schedules and processing the student. The professor abroad is selected with more deliberate and thorough discrimination than is yet the common tradition here, and then rewarded with a greater measure of confidence.

I think it was Otto Warburg who told me that if one of the Kaiser Wilhelm Gesellschaft institutes were to be devoted to histology, and if the man chosen to head that institute wished to devote the largest share of his funds to maintaining an elephant from whose patient hide histological specimens could be daily clipped, the general attitude would be one of curiosity and expectation rather than censure and, as the too sadly current

idiom has it, of "turning on the heat." I liked a story Professor Barcroft told me of Sir William Hardy: "Hardy told me two years before he died that he was beginning to be interested in the edges of substances. Now Hardy was the kind of individual who, had he lived, would soon oblige somebody to look up the Greek word for edge and add 'ology,' for what Hardy began as an interest he was likely to leave as an accomplished field of study."

There is a certain dignity in the scholar's position in Europe; it gives us all pause. I think it derives from the stability of his situation. I remember once visiting a medical school in Scandinavia. The dean told me that in visiting one of the professors I would see a very neurotic individual. It proved to be true, and when I saw the dean later he said a little quizzically, "I think this man would be what you call in your country 'fired,' isn't it?" I said I thought so. He replied: "We think it is more important to have the professorship inviolate than to have one neurotic professor in one subject, in one school. And," he added, "this tradition makes us more careful when we select professors."

As part of the respect for the individual I wish we could have in this country a larger measure of interest in what could be called the natural history of the creative process. All too rarely does one see acknowledgment of the fact that between periods of creative activity many a man experiences a fallow period. When competitive conditions are exaggerated, this fallow period is coldly denominated "sterility." I think we need sometimes less competition and more encouragement. I do not want to seem sentimental, but honestly so intense during the long winter months is the atmosphere of criticism, and unfavorable criticism, that I sometimes suspect that academic people have to stage a parade before commencement with gowns and regalia and words of praise and honorary degrees, in order to recapture the fragments of their fractured self-regard. As part also of a certain naturalism in the European universities comes their custom of rotating administrative work rather than fixing it upon single individuals. Deanships and rectorships rotate and so rotating furnish political education and administrative experience, and, I might add, sympathy, to a large number of professors. Nor are responsibility and policy left entirely to the older men. At Cambridge, for example, the junior fellows share in the actual governance of the college.

What have we in North America to link the university to society in general, to allow occasional but thorough contemporary evaluation of the universities' work? This is part of what I would call ecology of the university. What are the means of responsible criticism by society at large? The university president? The public relations vice-president or office? The alumni? The regents or trustees? What corresponds in competence and impartiality to the rector for the universities in Sweden? To the British Royal Commission? Or to the University Grants Committee? I've always liked the delicacy of the phrase "University Grants Committee," since it's named not for the donor, which is the government, but for the recipients, the universities. If you doubt the importance of the effect of society on the university, think of the danger that lay in the German universities being so close to the government. The professors were in most cases government employees, and when a political group seized the power of the government the professors were included among the newly acquired possessions. We need further reflection upon the ways in which society can wisely criticize the university and ways in which the university could sense and in some cases implement such criticism.

And now to summarize: The North American scene is characterized by a culturel homogeneity that overwhelms dissent and puts protest upon the defensive. Our universities are divorced from national policy and practical affairs, and this heightens a policy to emphasize learning by symbols rather than by experience and makes the word "academic" an equivalent for "impractical." Our secondary education is inadequate, not for its own objectives, but certainly so for the needs of the university. We overemphasize the importance of teaching and so rob the student of experience and of practice in the strategy of his existence. And, lastly, we have too many students, and this dilutes the quality of university experience for those best qualified to receive it.

I think experience in Europe would make you wish we had emphasis upon the conception of the university as a place where a certain kind of living and example are best realized. You'd find a large measure in Europe of interest of the élite in their responsibilities, an interest in quality, be it ever so rare, and a respect for the individual—his vagaries as well as his excellences. You might come to see, as I have, that there are advantages in the measure of self-direction and self-management of the European universities and in the somewhat austere simplicity of the European scholar's life. You'd return reflecting upon the significance of the university to society and the responsibility and reflective criticism each of the other.

In this huge and homogeneous area of North America I have ventured to call attention to functions I should like to see more of if we in the universities are to be in part responsible for maintaining and cherishing delight in beauty, enjoyment of reason and joy in the skills of living.

SCIENTIFIC EVENTS

VISITATION DAY AT THE GREENWICH OBSERVATORY

THE Board of Visitors of the Greenwich Observatory met on June 3 to receive the report of Dr. Spencer Jones, Astronomer Royal, on the work of the observatory for the year ending April 30.

Attention is called by the London *Times* to the circumstance that in the printed list of visitors the names of professors and others who occupy the position *ex-officio* remain as heretofore, but to the names of those nominated by the Royal Society and the Royal Astronomical Society, six in each case, a date is affixed to show that each is nominated for a period and indicating when that period expires. In this year's list Sir James Jeans and J. H. Reynolds give place to Dr. C. G. Darwin and Dr. R. Stoneley. The name of the late Sir Frank Dyson was printed in the list, and with that exception all the members were present. The invited company numbered nearly four hundred.

The Astronomer Royal, according to the report, is much concerned about the present suitability of Greenwich for certain branches of work, and for that of Abinger in Surrey, to which the magnetic registration of the elements of the earth's magnetic field was transferred in 1924. The electrification of further sections of the Southern Railway has made the removal of the magnetic observations a necessity. Experiments have been made at Selsey which show that the site should be not less than eight miles from any electrified railway, which, if the magnetic observatory is to remain in the south of England, limits the choice to Devon. As to the astronomy, the building developments southward of the observatory from which direction the prevailing winds come and the growth of industries near the river, together with modern developments of street lighting and the extensive use of neon signs, all have their adverse effect on long-exposure photography and in other ways. A table is given of the comparison of sunshine records at Kew and Greenwich which is striking. Twenty-five years ago the average yearly total at Greenwich was 60 hours in excess of Kew's; this has gradually diminished, and now the Greenwich total is less by 160 hours, this being ascribed to loss of register at Greenwich when the sun is low caused by atmospheric impurities.

Dr. Jones closes his report with the remark: "Proposals for the removal of the whole of the astronomical work from Greenwich and of the magnetic work from Abinger to new and more favorable sites are accordingly under consideration."

SURVEY OF THE CENTRAL AND SOUTH PACIFIC OCEAN

PLANS for an extensive scientific survey of the Central and South Pacific Ocean, with a view to solving some of its fundamental problems, have been announced by Dr. Gilbert Grosvenor, president of the National Geographic Society.

Arrangements for the expedition, which will be made on a Coast Guard Cutter, have been reached in consultation with President Roosevelt, Secretary Hull and Under-Secretary Welles, Secretary Morgenthau and Rear Admiral Russell R. Waesche, commandant of the Coast Guard, who are particularly interested in the contributions to navigation, both by water and air, that will be made by the magnetic studies which are a part of the work of the expedition. Concurrently with the carrying on of scientific work, the Coast Guard will make a survey of the present and future needs for navigational aids and radio facilities to assist marine and air commerce.

Professor Wilbur A. Nelson, chairman of the department of geology of the University of Virginia, will be the leader of the expedition. The party will include geophysicists, a geographer, a cartographer and a photographer, provided by the National Geographic Society; specialists on gravity from the U. S. Coast and Geodetic Survey; on magnetism from the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, and in marine biology from the Smithsonian Institution.

The National Broadcasting Company will send radio engineers to investigate radio phenomena, and will arrange a number of broadcasts by members of the scientific party from remote islands.

The cutter which will transport the expedition will be one of the newest and largest steel ships of the Coast Guard with a length of 327 feet and a displacement of 2,000 tons. It is fitted with the latest type of sonic depth-finders with which ocean depths are quickly ascertained by measuring the split-second time during which a sound travels to the ocean bottom and is echoed back. It carries a two-seater scout observation seaplane which will be used in making aerial photographs and maps of islands.

An important aspect of the work will be the attempt to solve by geophysical methods some of the fundamental geological problems of the Pacific. Stations on the various islands for gravity and magnetic determinations will be set up. At the same time the geology and structure of the islands will be studied. Although a number of magnetic determinations were made in the area a decade and more ago, no gravity work has been carried on there, and there has been no opportunity to relate magnetic, gravity and geologic observations.

The expedition will sail from San Francisco and will make one of its early stops at Canton Island, potential way-station for an air service between the

United States and Canada, on the one hand, and New Zealand and Australia on the other. Canton Island was the base of operations for another National Geographic Society expedition which, with the U. S. Navy, observed the total eclipse of the sun in June, 1937. It is now under joint American and British control. During its twelve months in the field, the ship will put in at intervals at Honolulu and Auckland, New Zealand, for supplies and mail.

The expedition, which will start next September and will be in the field for a year, will be conducted by the society and the University of Virginia, with the cooperation of the United States Coast Guard.

THE NEW YORK INSTITUTE FOR HOSPITAL ADMINISTRATORS

THE first New York Institute for Hospital Administrators opened a course of instruction on June 19 at the College of Physicians and Surgeons of Columbia University with an address by Dr. Malcolm MacEachern, associate director of the American College of Surgeons and president of the International Hospital Association. The institute will continue through July 1.

Authorities on all phases of hospital administration speak on the problems and progress in that field. Ninety hospital superintendents, assistant superintendents and department heads have enrolled for the course, which includes round-table discussions. No public meetings are scheduled.

The institute is sponsored by the American College of Hospital Administrators and the Greater New York Hospital Association in cooperation with the faculty of medicine of Columbia University. Dr. Claude W. Munger, director of St. Luke's Hospital, is director. Dr. S. S. Goldwater, commissioner of the Department of Hospitals, is chairman of the advisory committee.

Among the speakers are Dr. Haven Emerson, of the College of Physicians and Surgeons; Dr. Joe R. Clemmons, director of Roosevelt Hospital; Dr. C. Rufus Rorem, of the American Hospital Association; Dr. Frederick MacCurdy, superintendent of Vanderbilt Clinic; Miss Edith Field, record librarian of Grasslands Hospital, Valhalla, N. Y.; Emanuel Hayt; Dr. E. M. Bluestone, director of Montefiore Hospital; Miss S. Margaret Gillam, director of the department of nutrition, New York Hospital, and James A. Hamilton, director of New Haven Hospital.

The program is intended for those familiar with the hospital field and does not offer a training course in hospital administration. It is expected to stimulate ideas and improvement in the management of hospitals.

Two lectures are given each morning from 9 to 10:30 o'clock and from 10:30 to 12. In the afternoon, field trips to selected hospitals demonstrating various features of hospital administration have been arranged.

The subjects of the round table discussions of the evening sessions include hospital-care insurance, hospital financing, personnel management, nursing service, medical records, diet therapy, community relationships and the hospital as an educational institution.

A similar program for hospital administrators on the Eastern seaboard is being held this summer at Duke University, North Carolina.

MEETINGS OF THE THIRD COMMISSION OF THE INTERNATIONAL SOCIETY OF SOIL SCIENCE

THE third Commission of the International Society of Soil Science, concerned with the subject of soil microbiology, will hold meetings in New Brunswick, N. J., from August 30 to September 1, at the New Jersey Agricultural Experiment Station and Rutgers University. Papers will be presented on three subjects. The program on August 30 will be concerned with the subject of "Legumes and Legume Bacteria," and reports will be given by the following: W. A. Albrecht, University of Missouri; F. E. Allison, United States Department of Agriculture; A. Demolon, Centre National de Recherches Agronomique, Versailles; J. Dufrenoy, University of Bordeaux; H. Katznelson, N. J. Agricultural Experiment Station; L. T. Leonard, United States Department of Agriculture; K. V. Thimann, Harvard University; H. G. Thornton (president of the commission), Rothamsted Experimental Station, England; W. W. Umbreit and P. W. Wilson, University of Wisconsin; A. I. Virtanen, Biochemical Institute, Finland; A. L. Whiting, the Urbana Laboratories, Illinois. The subject of "Microbiology of Soil Organic Matter" will be discussed by the following on the morning of August 31: Chr. Barthel and N. Bengtsson, Lantbrukshögskolan, Sweden; F. E. Clark and Charles Thom, United States Department of Agriculture; D. Fehér, Institute of Forestry, Hungary; H. Murata, Kagoshima Imperial College of Agriculture and Forestry, Japan; A. G. Norman, the Iowa State College; C. E. Skinner, University of Minnesota; S. C. Vandecaveye, the Washington State College; S. A. Waksman, N. J. Agricultural Experiment Station; J. Marszewska-Ziemiecka, the National Institute for Agricultural Research, Poland. Papers will be presented on the subject of "Azotobacter and Its Significance in Soil Processes" during the afternoon of August 31 by the following: G. Guittonneau, Institute National Agronomique, France; C. K. Horner and Dean Burk, United States Department of Agriculture; H. W. Reuszer, Colorado Agricultural Experiment Station; R. L. Starkey, N. J. Agricultural Experiment Station; M. Winnik and M. Goldberg, Mikveh-Israel Experimental Station, Palestine. A conference will be held on "Legume Inoculants" under the direction of A. W. Hofer, of the N. Y. (Geneva) Agricultural Experi-

ment Station. Following the meetings, there will be an excursion on September 1 to some of the agricultural regions of New Jersey.

The meetings are being held in close cooperation with the third International Congress for Microbiology, which will be opened on September 2. Those wishing information concerning the program and arrangements should communicate with R. L. Starkey, Agricultural Experiment Station, New Brunswick, N. J.

THE SIXTH PACIFIC SCIENCE CONGRESS

THE sixth Pacific Science Congress will be held from July 24 to August 12 at Berkeley, Stanford University and San Francisco, California, under the auspices of the National Research Council. The general arrangements are in charge of the Committee on Pacific Investigations of the council. Responsibility for perfecting the program and for local arrangements has been assigned to a committee on the sixth Pacific Science Congress. In the detailed conduct of the congress, the committees in charge will be represented by an executive committee. Cooperating with these committees is the Department of the Pacific Area of the Golden Gate Exposition, 1939, of which Dr. Ray Lyman Wilbur, president of Stanford University, is chairman, and Philip N. Youtz, director.

Stanford University and the University of California will be the host institutions for the congress. The Golden Gate International Exposition will assist and cooperate with them. The sessions of the first period, from July 24 to August 5, will be held mainly at the University of California at Berkeley, which will provide meeting places. The sessions of the second period, from August 6 to 12, will be held at Stanford University.

Through the courtesy of the State Department of the United States, invitations to participate have been extended to forty-two countries which are either included in the Pacific area or have dominions, colonies, territories or dependencies within the area. Individual invitations have also been extended to many scientific men in these countries to contribute to the section programs. The following reports of standing committees authorized by the fifth Pacific Science Congress will be presented:

Oceanography of the Pacific, Thomas G. Thompson, *chairman,* professor of chemistry and director of Oceanographic Laboratories, University of Washington.

Volcanic Rocks, Patrick Marshall, *chairman,* vice-president, Royal Society of New Zealand; testing officer, Public Works Department, Wellington.

Blood Groups, L. T. Ride, *chairman,* professor of physiology, University of Hong Kong.

Protection of Nature, M. Miyoshi, *chairman,* professor of botany, emeritus, Imperial University of Tokyo, and Carl Skottsberg, *secretary,* professor of botany, University of Göteborg, and director of the botanical gardens.

Soil Survey and Classification, Boris B. Polynov, *chairman,* commission for the nomenclature, classification and mapping of soils, International Soil Science Association, Groningen, Netherlands.

Classification and Utilization of Land, W. C. Lowdermilk, *chairman,* chief, Research Division, U. S. Soil Conservation Service.

Forest Resources, D. Y. Lin, *chairman,* director of forestry, Ministry of Economic Affairs, Chunking, China.

Pacific Economic Entomology, Harry S. Smith, *chairman,* professor of entomology in the Citrus Experiment Station and Graduate School of Tropical Agriculture of the University of California, Riverside.

Mountain Structures, H. A. Brouwer, *chairman,* professor of geology and director of the Geological Institute, University of Amsterdam.

Seismology, Ernest A. Hodgson, *chairman,* seismologist, Dominion Observatory, Canada.

The special program is divided into eight sections as follows:

The Pacific Basin; structure and dynamics: geology and geophysics.

The Pacific Ocean; properties, dynamics, life: oceanography and marine biology.

Pacific climates, past and present.

Man and culture in the Pacific region; characteristics, dispersal and development, objectives and results of research: anthropology, human geography and ethno-botany.

Terrestrial fauna of the Pacific islands and bordering lands; characteristics, origin, distribution, human relations: animal sciences.

Terrestrial flora of the Pacific islands and bordering lands; characteristics, origin, distribution and human relations; plant sciences.

Public health and nutritional problems of the Pacific region; tropical medicine and nutrition.

Soil problems of the Pacific islands and bordering lands; characteristics, utilization, conservation.

The public sessions that have been arranged include one to be addressed by Dr. Beno Gutenberg, professor of geophysics and meteorology, California Institute of Technology; another by Dr. Elmer Drew Merrill, professor of botany at Harvard University, and a third by Dr. H. U. Sverdrup, director of the University of California Scripps Institution of Oceanography at La Jolla. A number of excursions are planned to points of scientific interest.

SCIENTIFIC NOTES AND NEWS

THE seventy-fifth birthday of Dr. Frank M. Chapman, curator of birds and member of the scientific staff of the American Museum of Natural History for more than fifty years, was observed on June 12 at a luncheon in the Flying Bird Hall which was attended by members of the scientific and administrative staffs and by friends of Dr. Chapman. After the luncheon Dr. John T. Zimmer, executive curator of birds, presented him with a volume of a hundred and fifty birthday letters from friends throughout the world, and F. Trubee Davison, president of the museum, unveiled a bronze bust of Dr. Chapman, the work of Mrs. Bessie Potter Vonnoh. It will be installed permanently in one of the bird halls.

FRIENDS and associates of W. W. Skinner tendered him a dinner on May 16 to celebrate his appointment as associate chief of the Bureau of Chemistry and Soils, which after July 1 will be known as the Bureau of Agricultural Chemistry and Engineering. Dr. Skinner has been identified with the bureau for thirty-five years. H. G. Knight, chief of the bureau, acted as toastmaster.

THE doctorate of laws was conferred by St. Lawrence University, Canton, N. Y., on June 12 on Dr. Karl T. Compton, president of the Massachusetts Institute of Technology, who gave the principal address.

DR. S. C. LIND, dean of the Institute of Technology of the University of Minnesota, was awarded the honorary degree of doctor of science by Washington and Lee University at its one hundred and ninetieth commencement on June 9.

LEHIGH UNIVERSITY conferred at its commencement exercises the degree of doctor of science upon Dr. Dexter S. Kimball, dean emeritus of the College of Engineering of Cornell University.

DR. MERRITT F. MILLER, dean of the College of Agriculture of the University of Missouri, has received the degree of doctor of science from the Ohio State University.

THE honorary degree of doctor of science was conferred on June 13 by Waynesburg College, Pennsylvania, on Dr. Edward R. Weidlein, director of the Mellon Institute, who delivered the commencement address.

AT Christ's College, Cambridge, Dr. Charles Galton Darwin, who recently retired from the mastership of the college to take up the appointment of director of the National Physical Laboratory, has been elected into an honorary fellowship of the college.

DR. SIGISMUND S. GOLDWATER, commissioner of hospitals of New York City, recently received the third annual award of the City Club. This award is made annually to "a non-elective public servant who has in the estimation of the trustees rendered outstanding public service to the city."

PROFESSOR HERISSEY, who holds the chair of biological chemistry at the Faculty of Medicine of Paris, and Professor Léon Binet, who holds the chair of physiology, have been elected to membership in the Paris Academy of Medicine. Professor Marc Tiffeneau, dean of the Faculty of Medicine, has been elected a member of the Academy of Sciences.

DR. E. D. ADRIAN, professor of physiology, will represent the University of Cambridge at the bicentenary ceremonies of the Royal Swedish Academy of Sciences, Stockholm, which will be held on September 23, 24 and 25.

AT the recent anniversary meeting of the Linnean Society of London the following officers were elected for the year 1939–40: *President,* Dr. John Ramsbottom; *Treasurer,* Francis Druce; *Secretaries,* Isaac H. Burkill (botany) and Dr. Malcolm A. Smith (zoology); *New Members of Council,* Professor T. M. Harris, H. R. Hewer, Professor T. G. B. Osborn, H. W. Parker and Dr. Malcolm A. Smith.

AT the annual general meeting of the British Institute of Physics the following officers were elected: *President,* Professor W. L. Bragg; *Vice-president,* Professor A. Ferguson; *Honorary Treasurer,* Major C. E. S. Phillips; *Honorary Secretary,* Professor J. A. Crowther; *New Members of the Board,* Dr. H. Lowery and R. S. Whipple, and J. H. Awbery, appointed by the Physical Society.

DR. JOHN Y. GRAHAM, since 1897 professor of biology at the University of Alabama, will retire from active service at the close of the college year.

DR. KARL DALE SWARTZEL, since 1922 professor and head of the department of mathematics at the University of Pittsburgh, retired on June 14.

DR. JAMES G. HORSFALL, professor of plant pathology and chief of research at the New York State Agricultural Experiment Station at Geneva, N. Y., has been appointed head of the department of botany of the Agricultural Experiment Station at New Haven. He succeeds the late Dr. G. P. Clinton, who died in 1937 after completing thirty-five years in the service of the state.

DR. WALTER A. BLOEDORN, professor of medicine at the George Washington University School of Medicine, has been appointed dean of the school to fill the vacancy that occurred when Dr. Earl B. McKinley was lost on the Hawaii Clipper in July, 1938.

DR. GEORGE P. MURDOCK, chairman of the department of anthropology of Yale University, has been promoted to a professorship of ethnology.

DR. TRACY M. SONNEBORN, of the Johns Hopkins University, has been appointed associate professor of zoology at Indiana University.

DR. J. T. IRVING, head of the department of physiology of the Rowett Research Institute, Aberdeen, has been appointed to the chair of physiology in the University of Cape Town.

DR. JAMES P. SCHOOLEY, research associate in endocrinology at the department of genetics, Carnegie Institution of Washington, Cold Spring Harbor, Long Island, N. Y., has resigned to become director of endocrine research at Difco Laboratories, Incorporated, Detroit.

DR. HERMAN N. BUNDESEN, who has been on a leave of absence since November, 1938, has returned to his work as health commissioner and president of the Board of Health of Chicago. Dr. Robert A. Black has been acting president of the board during his absence.

DR. H. P. SMITH, professor of pathology at the College of Medicine of the State University of Iowa, has received a grant of $1,500 from the John and Mary R. Markle Foundation for further studies in blood coagulation and hemorrhagic diseases. This grant is in addition to one of $10,000 previously awarded for studies in this field.

A REORGANIZATION of the editorial board of *The American Journal of Anatomy,* necessitated by the recent death of Dr. Charles R. Stockard, who was managing editor for seventeen years, has been completed. The appointment of Dr. George W. Corner, the University of Rochester, to be managing editor in succession to Dr. Stockard, has already been announced. Dr. George L. Streeter, the Carnegie Institution, Baltimore, who has been an associate editor for many years, will continue in that capacity. Dr. C. M. Jackson, the University of Minnesota, has asked to be released from editorial duties after eighteen years' service. The following have been appointed associate editors: Dr. Wayne J. Atwell, University of Buffalo; Dr. Sam L. Clark, Vanderbilt University; Dr. Harold Cummins, Tulane University, and Dr. George B. Wislocki, Harvard University.

AT a symposium of invited papers on "Nuclear Fission," to be held by the American Physical Society at a regular meeting of the society on June 23 and 24, Dr. M. A. Tuve, of the Carnegie Institution of Washington, speaks on "The Discussion of Experimental Information Regarding Fission Processes," and Professor John A. Wheeler, of Princeton University, speaks on "The Mechanism of the Nuclear Fission."

PROFESSOR W. L. AYRES, of the University of Michigan, gave two addresses on May 31 before the department of mathematics of Wayne University on "The Coloring of Maps" and on "Peano Spaces and Their Decomposition."

DR. JAMES ROWLAND ANGELL, educational counselor of the National Broadcasting Company, president emeritus of Yale University, was the commencement speaker on June 15 at the University of Buffalo.

AN exchange of visits has been arranged between the Kaiser Wilhelm Gesellschaft of Berlin and the Royal Society of London. As part of this arrangement Professor Baron von Verschuer, of Frankfurt, a.M., delivered on June 8 a lecture at the Royal Society entitled "Twin Research from Francis Galton to the Present Day," and on June 9 Professor Richard Kuhn, of Heidelberg, delivered a lecture on "Chemical Bases of the Biological Action of Light."

PLANS are being made for the perpetuation in an American Museum of Health of most of the exhibits in the Public Health and Medicine Building at the World's Fair. Dedication ceremonies of the new organization, which is supported by funds from philanthropic groups and insurance companies, were held in the Public Health and Medicine exhibit on June 17. The speakers included Mayor La Guardia, Surgeon General Thomas Parran, Dr. John L. Rice, city health commissioner, and Grover A. Whalen, president of the fair. Dr. Livingston Farrand, president emeritus of Cornell University, acted as chairman. A building to house the exhibits of the new museum has not yet been selected. Cooperation in obtaining a site for the museum has been promised by Mayor La Guardia, one of the directors. Other directors include Dr. Louis I. Dublin, Dr. George Baehr, Homer N. Calver, Dr. Farrand, Dr. David J. Kaliski, Sam A. Lewisohn, James Marshall, George McAneny, Dr. Seth Milliken, Frederick Osborn and Dr. Rice. Contributing to the support of the museum are the Carnegie Corporation of New York, the Rockefeller Foundation, the Oberlaender Trust and eight insurance companies.

THE new building of the Memorial Hospital for the Treatment of Cancer and Allied Diseases, New York City, was dedicated on May 15. Among the speakers at the ceremony were Dr. James Ewing, director of the hospital; Dr. J. G. Schurman, formerly president of Cornell University, later ambassador to Germany; Dr. S. S. Goldwater, commissioner of hospitals, New York City; Dr. William D. Coolidge, director of the Research Laboratories of the General Electric Company at Schenectady; Dr. Ludvig Hektoen, director of the National Cancer Council, and Dr. Burton T. Simpson, director of the New York State Institute for the Study of Malignant Diseases. Dr. James B.

Murphy, of the Rockefeller Institute, presided at the morning session, and Walter Douglas, chairman of the board of managers of the hospital, presided at the dedication ceremony. Mr. Robbins declared the institution officially opened and invited the guests to inspect the building. The cost of the new plant was approximately $5,500,000. John D. Rockefeller, Jr., gave the site. The principal donations for the construction were $3,000,000 from the General Education Board and $500,000 from Edward S. Harkness.

THE new Whitney Memorial Wing at the American Museum of Natural History, built at a cost of $1,500,000 after ten years of planning and preparation, was dedicated on June 6 before a gathering of five hundred invited guests, including J. P. Morgan and Mrs. Harry Payne Whitney. The new building, which has eight stories and which will house a collection of 750,000 birds, is the joint gift of the late Harry Payne Whitney and of New York City. It contains three floors of public exhibits, including the Whitney Memorial Hall, the Hall of the Biology of Birds and the Gallery of Bird Art. Four floors house the large collection of specimens and on the top floor are the new laboratories designed for the study of living birds.

Museum News states that the North Central Washington Museum Association has been organized and incorporated at Wenatchee, Wash., and has obtained the use of the former city library for a museum. This building is being renovated through donated services and material. Enough exhibits are expected to be in place so that the museum can be opened this month. It will include art, history and science in its program. The organization of the association and the acquisition of the building are in large degree the result of efforts, beginning many years ago, on the part of the Columbia River Archeological Society, of which Alan G. May is president. Officers of the Museum Association are K. P. Sexton, *president;* Mr. May, *vice-president;* A. V. Shephard, *secretary,* and Mrs. Gilbert Brown, *treasurer.*

THE Congress has been asked for a special appropriation for the Department of Commerce to finance a study of the fishery resources of the Hawaiian Islands as part of a plan for the development of the fisheries of the islands. The study would include a survey of available aquatic resources from which fisheries which now show signs of depletion could be restored. A preliminary report by the Bureau of Fisheries recommends that a survey be conducted to determine the species of fish which are available in the seas surrounding the islands.

THE New York Academy of Medicine announces the establishment of "The Robert Livingston Seaman Fund for the furtherance of research in bacteriology and sanitary science," with six hundred dollars available for assignment in 1939. This fund has been made possible by the terms of the will of the late Dr. Robert Livingston Seaman and will be administered by a committee of the Academy of Medicine under the following conditions and regulations: (1) The committee will receive applications from either institutions or individuals during the summer and up to September 15, 1939. Communications should be addressed to Dr. Wilson G. Smillie, chairman, 2 East 103rd Street, New York City. (2) The fund will be expended only in grants in aid for investigation or scholarships for research in bacteriology or sanitary science. The expenditures may be made for the securing of technical help; for aid in publishing original work and for the purchase of necessary books or apparatus.

DISCUSSION

THE DISCOVERY OF ANTARCTICA: A REPLY TO PROFESSOR R. N. RUDMOSE BROWN

IN the *Scottish Geographical Magazine* of May, 1939,[1] Dr. R. N. Rudmose Brown, the eminent British geographer, has reviewed my recent monograph[2] in an effort to impeach its accuracy and establish the British claim that Bransfield discovered the Antarctic continent.

In his article Brown has used terms so loosely and has misquoted me so generously that a full reply to all his statements would not be practicable within the compass of this article. I shall, therefore, content myself by whatever of reputation I may have for thoroughness of research and for a practice of resorting wherever possible to original source material. I shall hope that the more serious student of Antarctic history may be led to read my monograph as well as the British reviews of it.

In my investigation of this subject I started out determined to leave no stone unturned in order to get access to all available facts, let them strike where they would.[3] The picture uncovered by my studies was not an attractive one and, as it happened, not one in which the British Admiralty or British geographers generally could take pride. It has been expected that such ex-

[1] *Scottish Geographical Magazine,* 55: 3, 170–173; see also *Nature* of April 29, 1939.

[2] *Trans. Amer. Philos. Soc.,* n. s., 31: pt. I, January, 1939, pp. 1–71, pls. I–XXXI, text maps 10.

[3] Dr. Brown seems to have overlooked the fact that I have classed the American sealer, Benjamin Morrell, as a fake explorer. He did not, like Weddell, purloin a map or falsify one, but he did claim to have sailed into the Weddell Sea about half as far as Weddell's alleged cruise, and he has been generally discredited by British writers.

plosions as have come from Messrs. Brown and Hinks[4] would not be long delayed.

With this preliminary statement let me refer to some of the more fundamental strictures of Professor Brown which seem to require an answer. He states that "two accounts have been published" of the cruise of the brig *Williams* into Antarctic waters when Bransfield was her master. The first is the authentic account by Dr. Adam Young, R.N., surgeon of H.M.S. *Slaney,* one of the five Royal Navy officers on board the vessel. Dr. Young supplied the published account of the expedition, which appeared in April, 1821, in a Scottish scientific journal of high repute, the Edinburgh *Philosophical Journal.* This report, which was issued within a year of the time the news could have reached Europe, was accepted by geographers in both Europe and America. The Smith-Bransfield map reprinted from the Edinburgh journal was entered in atlases all over the world. Fourteen of these atlas reproductions of the Bransfield map I found in various libraries, and thirteen of them I reproduced. There may be others.

The "other account" referred to by Brown is an *anonymous* one which appeared a year and a half later in an obscure journal a few weeks only after the publication in London by the Admiralty's chart maker and seller of a map of Palmer's Land named for its discoverer, the American sealing captain, N. B. Palmer. Palmer had discovered the land on November 18, 1820, as described in his log, now in the Library of Congress. The belated story in the *London Literary Gazette,* quite unlike the official account by Surgeon Young, described an additional cruise of Bransfield's vessel some 250 miles farther to the east than in the authentic account, with the discovery of the Elephant-Clarence Island group; then a return cruise which was continued along the south side of the South Shetland "land mass"; then a diversion to the south with the discovery of the Antarctic continent in about the same position as Palmer Land. The land was named in this account "Trinity Land," not the Holy Trinity, but for a triune division within the British Admiralty.

This later account, covered by a convenient anonymity, but which awards the discovery of the Antarctic continent to a British naval officer, is preferred by Brown, though he thinks "the nationality of the discoverer of Antarctica is of no consequence." Yet Brown would probably agree that efforts should be made to do justice to the individual explorers themselves, be they British or American.[5]

[4] See end of my article, "The Pack-ice of the Weddell Sea," *Annals Assoc. Amer. Geog.,* 29: 2, June, 1939, pp. 159–170.

[5] As long ago as 1927 Dr. Brown was arguing for Bransfield against Palmer for the discovery of Antarctica upon the basis of the map in the Hydrographical Office ("The Polar Regions," 1927, p. 23).

Dr. Brown has stated loosely that a map by Bransfield to show this cruise was "published" by the Admiralty. He is in error. There is an unpublished map engraved at the Hydrographical Office made to fit the anonymous account, and also a similar drawn chart without track of the vessel but with the signature "Bransfield." The engraved sheet is dated November 30, 1822, which is a month after the Palmer's Land map had been printed by R. H. Laurie, the chart publisher of the Admiralty.

There is also filed in the Hydrographical Office of the Admiralty an unpublished map ascribed to the British sealer William Smith, which sets forth his discoveries when he on February 19, 1819, first sighted the South Shetland Islands. Though as shown by both his authentic published log and chart (and by this chart as well) Smith had kept well to the north of the group, which he had taken for an Antarctic "land mass." Yet according to this map he had surveyed an *island* group, *on all sides* and in rough agreement with good later maps. He had even sighted the Antarctic continent a full degree of latitude farther away to the south behind the islands. This land was represented to be in the approximate position of the "Trinity Land" of the "Bransfield" unpublished chart. This alleged Smith map, obviously a forgery, and the "Bransfield" unpublished map were both a full century and more later published in the journal of the Royal Geographical Society and exploited to prove that Smith in February of 1819 and Bransfield in January of 1820 had each sighted the Antarctic continent.

Laurie, who as the Admiralty's chart publisher of course knew of these unpublished charts, wrote in the Notes accompanying the Palmer-Powell map of 1822: "The *Trinity Land* and *Tower Island* of the first charts, in about 63½° South and 60½° West are given up as imaginary, or as icebergs only."[6] The amazing thing is, not that the Admiralty decided not to publish such maps, but that British geographers (Bruce, Brown, Markham, Mill and others) have exploited the "Trinity Land" map to replace the authentic Smith-Bransfield map.

Though the Admiralty did not publish the chart as claimed and did not assign it a number, it did a little later (1824) *officially publish* a chart on which Palmer's Land is reproduced with photographic accuracy from the Palmer-Powell map, three different editions of which Laurie had himself already published in 1822. The pertinent portion of this Admiralty map is here reproduced in Fig. 1.[7]

The publication of this official Admiralty map is of much importance. At the bottom of it is printed,

[6] Notes on South Shetland, etc., 1822, p. 6.

[7] The first *published* map of "Trinity Land" is that by James Weddell, which appeared in 1825.

"London, published according to Act of Parliament at the Hydrographical Office of the Admiralty Nov^{r} 4th, 1824. Sold by R. B. Bate, 21 Poultry, for the Lords Commys^{D}. of the Admiralty, by their Appointment." Following the publication of this Admiralty chart, five British atlas publishers printed Palmer's Land upon their maps. It was later that the Admiralty exploited "Trinity Land," and still later "Graham Land" to replace Palmer's Land.

That, unlike the unpublished but alleged map of Bransfield which I have characterized as a fake, this Admiralty map was actually issued is further proven by the fact that a copy is found in the United States. The one here reproduced in part is from the Library of Congress and bears the title, "General Chart of South America. From the Drawing by Lieut. A. B. Becher, R.N. combined with the best English and Spanish Surveys in the Hydrographical Office and adjusted by the latest Astronomical Observations."

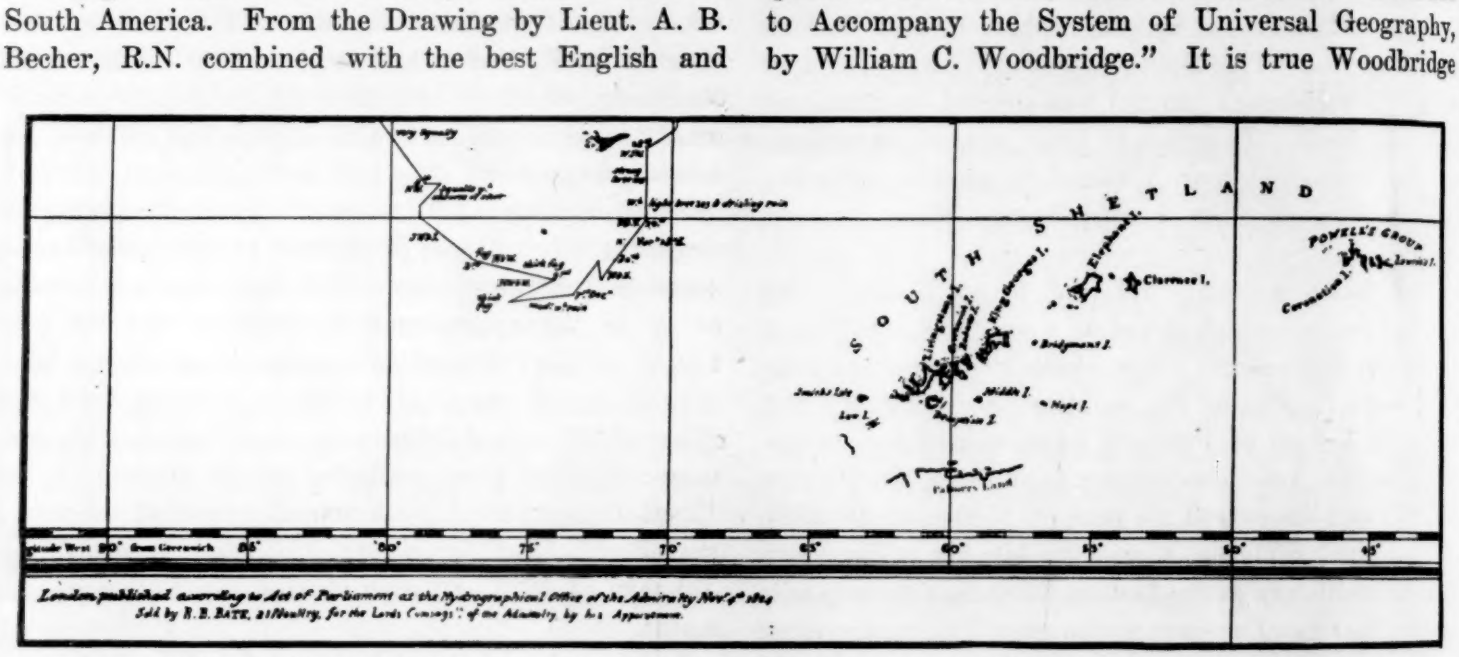
SOUTH SHETLAND
Elephant I.
Clarence I.
POWELL'S GROUP
Coronation I.
Laurie I.
Bridgeman I.
Middle I.
Nigel I.
Penguin I.
Smith I.
Low I.
Palmer's Land
London, published according to Act of Parliament at the Hydrographical Office of the Admiralty Nov^{r} 4th 1824
Sold by R. B. BATE, 21 Poultry, for the Lords Commys^{rs} of the Admiralty, by their Appointment.

FIG. 1. Portion of the first official map of Antarctic land published by the British Admiralty (reduced one third).

If the alleged Bransfield map at the Admiralty had been regarded as genuine—it is dated 1820—it is certainly remarkable that the Admiralty should issue this its first official map with Antarctic land in 1824, which is a year before their Royal Navy Captain, James Weddell, printed his map of "Trinity Land" "laid down from the information of respectable commanders of ships"—a map as different from the alleged Bransfield map as it is from the map of Palmer's Land.

Brown is again in error when he refers to my "exoneration of Palmer for making no mention of his discovery of land in his *official* log." I have done no such thing. Palmer does mention the land both in his log and in his diary. Brown appears to have read my monograph very carelessly and has here confused my statement that Palmer did not mention *in his log* the meeting with Bellingshausen, though he does treat it at length in his journal or diary.

Another example of careless reading is Brown's reference to the Palmer cruise of January, 1822 (he makes it 1821), which he has confused with the first discovery by Palmer of Antarctic land in 1820.

To discredit the Woodbridge map of September 28, 1821, on which Palmer's Land and the Shetland Islands appear quite correctly placed, and which is the first known published map that shows Antarctic land on the basis of discovery, Brown says, "A school atlas can scarcely be accepted as documentary proof of Palmer's precedence in discovery." The Woodbridge map, which is reproduced as the frontispiece of my monograph and is thus dated, is not a school map at all. William Channing Woodbridge was one of the most reliable American map-makers of his time, and his atlases became standard works. The atlas here in question has the title, "Modern Atlas on a New Plan to Accompany the System of Universal Geography, by William C. Woodbridge." It is true Woodbridge published *in addition* a school map upon a smaller scale on which the same material appears. Once more Dr. Brown has read very carelessly.

Brown's criticisms concerning Weddell and his alleged cruises, he has also treated in the issue of *Nature* for April 29, 1939, and I have met these criticisms in advance by my article published in the June number of the *Annals of the Association of American Geographers*. It seems therefore unnecessary to repeat them here.

WILLIAM H. HOBBS

UNIVERSITY OF MICHIGAN
JUNE 1, 1939.

HYPHENATION OF ENGLISH COMPOUND NAMES

IN a recent issue, Weatherby[1] calls attention to the growing use of compound nouns in the English language, with the comment that we may be in a transitional period, the final outcome of which will be the compounding of such words without separation of the

[1] C. A. Weatherby, SCIENCE, 89: 413, 1939.

parts by either space or hyphen, as in the Germanic languages. Perhaps it may be because of the present transitional state of the language that there seem to be no very definite rules as to when hyphens should be employed in such English compound nouns. Originally, perhaps hyphens were the general rule; but gradually usage has justified the omission of the hyphen in many cases. Then when two compound terms are compounded together, with the use of a single hyphen, the results are sometimes curious; *e.g.*, "the Great Northern-Northern Pacific railway system," a term which is clear enough to an American, but might puzzle a foreigner.

As editor of *Stain Technology,* the writer has to struggle again and again with the problem of hyphenation of compound names, trying to solve it in a way that is logical, consistent and at least fairly grammatical. Thus, although the term "spore former," as two words without a hyphen, is undoubtedly sanctioned by usage, the logic of "non-spore former" seems at least questionable; just what is a "non-spore"? This latter compound noun is quite simply improved by introducing a second hyphen; but when an author tries to describe some technic by the use of a compound term made up of all the principal ingredients used (themselves often compound nouns), the problem becomes more complicated. It is hard to justify such terms as "safranin-orange G-crystal violet technic" or "iron alum-hematoxylin phenol-Bismarck brown Y schedule." Such expressions as these are perhaps unambiguous to any one familiar with the names of dyes and the nature of staining solutions; but the layman, looking at the former, would never suspect that the "G" belongs with "orange" and "crystal" with "violet."

Does English have any rules for the hyphenation of such a compound term? The writer has been unable to find any, presumably because such compounding was originally foreign to the language. Granted that Weatherby is right in assuming that compound terms will some day be frankly recognized and written as one word, let us hope that some one will devise a system for use in doubly and triply compounded words to show which elements belong most closely together and which are related to the others more indirectly.

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USE OF PARENTHESES IN ZOOLOGICAL NOMENCLATURE

IN a recent communication, Dr. Osgood[1] ably argues for dropping the parentheses about authors' names when the specific designation of an animal has been changed. One of his arguments is that parentheses are unnecessary to the specialist and both unnecessary and confusing to the layman (such as, I suppose, a visitor to a museum).

Personally, I hold no thesis in this matter and am perfectly willing to follow any convention which seems to the majority wisest; but I wish to point out that not all who use zoological names are specialists in taxonomy nor, strictly speaking, laymen. General zoologists are often temporarily befuddled by the rapidity of changes in nomenclature, however wise and necessary these changes may be in themselves.

Recently, I have had occasion to make use of an extensive taxonomic literature upon a group whose members are not well known to me. In this task, I have found the conventional use of parentheses very helpful in tracing synonymy and I suspect that other non-taxonomic zoologists may have had similar experiences.

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QUOTATIONS

DISTRIBUTION OF THE YOUNGER STARRED SCIENTISTS[1]

THE distribution of productive scientists is certainly of great significance in an age of science, and can advantageously be studied geographically. A summary of the findings is of special interest to the scientists themselves.

Cattell has published, in the appendices of "American Men of Science," 1906–1933, some data as to the places of birth, education and work of the scientists who were, between 1903 and 1932, starred, by vote of their fellow specialists, as especially distinguished in research.

In the following discussion the scientists first starred in the sixth edition of "American Men of Science," issued in August, 1938, receive especial attention; but the 1938 distribution of all the living scientists starred in 1921–1937 is discussed. Detailed attention is given to the starred astronomers, geologists, chemists, physicists and mathematicians. Some comparisons are made, also, with the older groups of scientists, those starred in 1903 or 1910, nearly all of whom are now dead or retired.

DISTRIBUTION BY OCCUPATION, AGE, SEX

The occupational distribution of those of the nearly 500 scientists starred in 1932 or 1937 who report their employment in the 1938 edition of "American Men of

[1] Extracts from an article in the issue of the *American Journal of Science* for January, 1939.

[1] SCIENCE, 89: 9–11.

Science" is of interest. Seventy-six per cent. are connected with educational institutions and presumably are supported by their teaching. Only one twelfth are connected with research institutions and only one fifteenth are in government employ (aside from the state universities). Half of those employed by the Federal Government are in the Geological Survey. Less than one sixteenth are in applied or commercial science. Research institutions employ relatively many astronomers, chemists, pathologists and physicists. Comparison with the situation in 1906 and 1921–27, reported by Cattell, indicates that there has been a sharp decline in the number of anthropologists in federal employment; a sharp gain in the number of astronomers and botanists employed by research institutions; of geologists, the number in the U. S. Geological Survey has remained about stationary, the number in universities and state surveys has declined; in pathology there has been a shift to research institutions. Of the zoologists, there are far fewer in federal employment, more in research institutions and about the same proportion as formerly in universities.

The year of birth is available for all but four of the group starred in 1937. Two were born before 1870, 11 in the 1870's, 61 in the 1880's, 108 in the 1890's and 64 since then, the youngest in 1911, the next youngest in 1908, and 9 since 1905. The median year of birth is 1895. Age at starring: eight in the 60's, 21 at ages 55 to 59, 27 in the early 50's, 100 in the 40's, 56 in the last half of the thirties, 21 in the early 30's, 2 at 28, one at 26. The average age at starring is almost 43 years. (For the 1932 group, Cattell found the average age at starring of mathematicians and physicists to be 36, chemists 41, psychologists 44, biologists 46, pathologists 48, geologists 49.) Although the average age at starring of the 1937 group is almost exactly the same as for the 1932 group, the distribution is somewhat less concentrated, a third more being over 55 or under 36 at starring; one quarter instead of one third being aged 40 to 46. The youngest man of the 1932 starring was 27, another was 28, four others were 29 and seven were 30. Four were in their 60's in contrast with eight of the 1937 group.

Nine women were starred in 1937, four of whom were married; three are zoologists, two geologists; one each, in anatomy, astronomy, botany and psychology. In 1932 three women were starred; two zoologists and one anthropologist.

Distribution by Institutions

Table I gives by leading institutions the 1938 distribution of the scientists first starred in 1921–1937, according to the sixth edition of "American Men of Science." This table shows that the leading universities in this respect are Harvard 69, Chicago 45½ (a part-time person is given a half-rating), Columbia 39½, California 39, Yale 35, Michigan 32, Princeton 31, Hopkins 30 and Minnesota 26. The leading institutions which are not universities are the Carnegie Institution of Washington (31½), the U. S. Geological Survey (23½) and the Rockefeller Institute and Foundation (24).

TABLE I

STARRED SCIENTISTS AT LEADING INSTITUTIONS IN 1938
NUMBER OF THOSE STARRED IN THE YEAR INDICATED

	1921	1927	1932	1937	Total
Bell Tel. Lab.	2	6	2	3	13
Brown	6	1	1	0	8
California	8	7	14	10	39
Calif. Inst. Tech.	4	4	3	12½	23½
Carnegie Inst.	8	10	6	7½	31½
Chicago	9	14	11	11½	45½
Cincinnati	3	0	1	2	6
Columbia	13	9	10	7½	39½
Cornell	9	4½	7	5	25½
Duke	1	2	0	2	5
Harvard	17½	17½	17	17	69
Hopkins	10	4	7	9	30
Illinois	5	4	8	6	23
Iowa	1	0	4	3	8
Iowa State Col.	0	2	1	2	5
Kansas	2	2	1	0	5
Mass. Inst. Tech.	4	4	6	8	22
Michigan	8	4	11	9	32
Minnesota	8	4	9	5	26
N. Y. U.	1	2	1	3	7
North Carolina	1	2	1	2	6
Northwestern	5	1	2	4	12
Ohio	4	3	3	3	13
Pennsylvania	6	9	3	5	23
Princeton	6	4	10	11	31
Rockefeller	6	7	7	4	24
Rochester	2	1	4	3	10
Stanford	6	5	7	6	24
Swarthmore	2	1	0	2	5
Texas	2	3	1	½	6½
Thompson Inst.	1	1	1	2	5
United States					
Bureau of Standards	6	4	1	3	14
Dept. of Agriculture	2	3	2	5	12
Geol. Survey	4	7	5	7½	23½
National Museum	4	4	2	2	12
Virginia	1	1	3	1	6
Wash. (St. Louis)	3	2	3	1½	9½
Wisconsin	5	6	5	3	19
Yale	8	8	13	6	35

Schools with 4 each are: George Washington, Rutgers, St. Louis, Wesleyan. Schools with 3 each are: Indiana, Mt. Holyoke, Nebraska, Oberlin, Penn State, Pittsburgh, Tulane, Western Reserve. Schools with 2 each are: Arizona, College of the City of New York, Colorado Col., Conn. State, Rice, Trinity and Vanderbilt.

The totals given in Table I may be compared with corresponding data for 1906 given by Cattell. Universities which have about the same number of starred scientists on their faculty in 1938 as in 1906 are: Harvard with 66 in 1906 and 69 in 1938; Hopkins with 30, 30; Mass. Inst. Tech., 20, 22; Wisconsin 18, 19; Iowa 7, 8; Cincinnati 6, 6; North Carolina 5, 6; Kansas 5, 5; Western Reserve 4, 3; Texas, 5, 6½; Vassar 3, 3; Virginia, 7, 6.

Universities which have gained notably between 1906 and 1938 are: California 27 to 39; Yale 26 to 35; Michigan 20 to 32; Illinois 6 to 23; Princeton 15 to 31; Chicago 39 to 45½; Pennsylvania 17 to 23; Stanford 16 to 24; Washington (St. Louis) 5 to 9½; Ohio 10 to 13; Brown 5 to 8; and Northwestern 9 to 12; California Institute of Technology, not in existence in 1906, had only 7 starred men in 1927, but 23½ in 1938; Minnesota 10 to 26.

Universities which had fewer starred men on their faculty in 1938 than in 1906 include Columbia, 60 in

1906, 39½ in 1938; Cornell 33, 25½; Dartmouth 6, 1; New York 9, 7; Clark 7, 1; Indiana 6, 3; Missouri 9, 1; and Wesleyan 7, 4.

Since the 1938 edition of "American Men of Science" was put into type, more than a dozen men starred in 1921–1937 have died and several have moved. Hence the data given above are only approximately correct. A recently issued federal report[2] gives the distribution of starred scientists who were not yet 66 early in 1938. According to that table, which counts equally all persons in any way connected with the institution (not giving half weight as was done in the above article), Harvard, in 1938, had 83 starred scientists under age 66, Chicago 54, Columbia 50, California 47, Yale 41, Hopkins 36, Princeton 34, Minnesota 29, Michigan 28, Stanford 28, Cornell 26, Pennsylvania 25, California Institute of Technology 25, Wisconsin 22, Massachusetts Institute of Technology 22, Illinois 21. In federal service: the Geological Survey had 20, Bureau of Standards 16, Smithsonian Institution 11, Department of Agriculture 10; all other bureaus a total of 14.

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SPECIAL ARTICLES

PRE-LINGUISTIC SIGN BEHAVIOR IN CHIMPANZEE

THE expression "symbolic behavior" has been used frequently for types of adaptation which resist explanation by accepted principles of "animal learning," or even as substitute for "insight" and "higher mental processes." It is true that some of the most impressive contrasts between the behavioral capacities of man and other primates may be attributed to linguistic process or neural mechanism which is present in the former and either absent or rudimentary in the latter. Thus the great difficulty of double alternation[1] and temporal maze[2] problems for animals other than man may be attributed to inability to count. Likewise, differences in ability to respond to complex, obscure or novel relations, as in multiple-choice problems,[3] in rate of acquiring simple discrimination habits and in various tests of "reasoning" and "insight," are subject to a similar anthropomorphic explanation.

Analysis reveals, however, that many of these manifestations of behavioral adaptivity can be accounted for, without the postulation of symbolic processes, in terms of innate and acquired perceptual organization, generalization, transfer, processes involved in delayed conditioning and other relatively simple and widely applicable determinants of animal behavior. For example, performance in double alternation and temporal maze experiments might be explained as differential conditioning to two stimuli in a series of intra-organic stimulus-responses initiated by the external situation. Logically viewed, adaptive response to relations of varying degrees of complexity and unusualness, as widely exhibited in the animal kingdom, should not require the appearance of an entirely new process at some point in the series of events. Indeed, few if any of the attempts to account for tool using or construction and for other presumptively "insightful" problem solutions, occasionally exhibited by animals, have excluded the possibility that perceptual organization and transfer may suffice as principles of explanation.

Considerations, elsewhere discussed,[4] which suggest the operation of symbolic processes in delayed response will be summarized briefly. In infrahuman animals the establishment of a discrimination habit *in the absence of spatial cues* commonly requires a large number of differential rewards and frustrations, whereas the establishment of a comparable habit in delayed response tests *when spatial cues are available* may occur in a single trial and with signified versus actual reenforcement.[5] This contrast may be accounted for by the relative obtrusiveness and prepotency of the two varieties of cue or by the diversity of mechanism operative in the two cases. Man adapts as promptly to the delayed response type of situation without spatial cues as with them. It seems probable that his success is due entirely to capacity for linguistic response —use of symbols for white-black or right-left, as the case may be. The diverse observations cited may be brought into relation by assuming (*a*) that delayed response requires the mediation of a symbolic process and (*b*) that some of the vertebrates are capable of symbolic response to spatial but not to non-spatial cues. The latter assumption is strongly supported by the relative frequency and evident significance of spatial factors in the lives of most animals.

For present purposes a symbolic process may be conceived of as a differential, and usually implicit,

[2] "Research—a National Resource," (1) "Relation of the Federal Government to Research," National Resources Committee, December, 1938.

[1] W. S. Hunter, *Jour. Genet. Psychol.*, 35: 380*ff.*, 1928.

[2] S. D. S. Spragg, *Comp. Psychol. Monog.*, 13: 2, 38*ff.*, 1936.

[3] R. M. Yerkes, *Comp. Psychol. Monog.*, 10: 1, 89*ff.*, 1934.

[4] H. W. Nissen, A. H. Riesen and V. Nowlis, *Jour. Comp. Psychol.*, 26: 361–386, 1938. See also W. S. Hunter, *Behav. Monog.*, 2: 1, 1913, and *Psychol. Rev.*, 31: 478–497, 1924.

[5] J. T. Cowles and H. W. Nissen, *Jour. Comp. Psychol.*, 24: 345–358, 1937.

response established by previous training, whose "meaning," as exemplified by its positive or negative valence, is extremely labile. The sign response is differential in the sense and to the extent that it varies for different stimuli. It is especially significant that unambiguous differential delayed conditioning has been reported only for cases in which the stimuli were spatially differentiated. In discriminational behavior, including delayed response, lability of the consequences of sign response is manifest by the readiness with which approach and avoidance may replace one another. This feature of symbolic behavior distinguishes it from all instances of habit acquisition, including delayed conditioning, in which the nature or direction of the overt response is fixed only after many trials and can be changed or reversed with difficulty. This characterization of symbolic process differs to some extent from all the many definitions proposed. It is less limited than most of them, more specific than some. In common with other conceptions of symbol, it exhibits relationships to language, the outstanding difference in this respect appearing in what Morris[6] designates as the "pragmatical dimension of semiosis." We are interested in the experimental and systematic consequences of the concept of symbolic process, not in the problem of terminology.

Inasmuch as it has been demonstrated[7] that delayed response in the absence of spatial cues is possible for young chimpanzees, but only after very extensive training, it seemed to us not improbable that mature individuals, with the advantage of more varied experience, might possess this ability in higher degree and consequently be capable of prompt adaptation. To test this possibility, a survey was made of the reactive capacities of members of the Yale chimpanzee colony.

Twenty-four individuals (19 adult, 5 adolescent; 4 male, 20 female) were tested in the summer of 1938 by the following procedure. After brief preliminary training of a subject, two rectangular wooden boxes, with hinged lids, the one painted white, the other black, were displayed before the animal and it was permitted to see a piece of apple placed in the box at its right. Thereupon the boxes were taken up by the experimenter and shifted in position relative to one another beyond the range of the subject's vision. They were then presented before the netting wall of the animal's cage in such manner that it could definitely indicate its choice by lifting the lid of one box. The food-containing or correct box might be at the right, left, above or below a central point, and the white and black boxes were used with equal daily frequency and in irregular, predetermined order.

At the outset the experimenter shifted the boxes by turning his back upon the subject. At first 2, and later 4, trials were given per day. Under these simple conditions most of the subjects were given 96 trials.[8] The interval during which a box was hidden from a subject was not more than 2 or 3 seconds.

During this phase of the investigation, individual differences in the pattern of response and degree of success were extreme. Thus some individuals tried to follow the boxes visually as they were being shifted; others did not. Some acted as if keenly interested, eager and expectant of success; others as if relatively indifferent or lacking confidence in their ability to secure the food. The percentages of correct response for individuals ranged from 44 to 99. The average for all individuals in a total of 2,183 trials is 65 per cent. The subject who succeeded best made only one mistake in 96 trials, although she apparently made no effort to follow the boxes visually or to maintain direction of attention or bodily orientation during the brief interval of delay.

On the basis of the above results, the 8 individuals with highest scores (99, 94, 90, 86, 81, 72, 72, 69 per cent. correct) were selected for further use. Each subject was given a series of 10 trials daily, with predetermined order of use of the white and black boxes and of the presentational position and relation of the boxes. Shift of the boxes was effected behind an opaque screen, and they were invisible to the subject during this process for not more than 5 to 8 seconds.

In their first hundred trials these 8 animals ranged from 44 to 58 per cent. correct choices. Success in daily series varied from 20 to 90 per cent. Six subjects were above 50 per cent. correct, the chance score.

Once more the most successful subjects were selected and the experiment continued with 5 individuals. There was no immediate change in procedure. Success varied between 57 and 64 per cent. in the second hundred trials. For the third hundred, effort was made to attract the attention of the subject to the correct box by holding it up to view after it had been baited and by pointing to it as the subject watched box and experimenter.

At the end of the third hundred trials the experiment was discontinued because of evidence of diminishing success and varied behavioral indications of increasing discouragement and frustration. Witness the percentages for the last hundred trials, which range from 43 to 63, and also the results for the total series of 300 trials when percentages are figured by successive groups of 50 trials: 47.8, 55.8, 59.6, 61.6, 51.6, 58.4.

The accompanying condensed table presents data for the 5 subjects (2 males and 3 females, aged 8 to 14 years) who were used in the preliminary stages of the investigation and throughout the 300 trials reported in the table.

[6] C. W. Morris, "Foundations of the Theory of Signs," Univ. Chicago Press, pp. 29*ff*., 1938.

[7] H. W. Nissen, A. H. Riesen and V. Nowlis, *op. cit.*

[8] In 9 cases the trials varied between 45 and 95.

TABLE 1

Subjects	Average per cent. correct				Range in per cent.
	1–100 trials	101–200 trials	201–300 trials	Total	
Alpha	54.0	59.0	63.0	58.7	30–90
Bimba	54.0	57.0	61.0	57.3	30–80
Bokar	54.0	64.0	56.0	58.0	40–80
Frank	58.0	60.0	43.0	53.7	20–90
Lia	53.0	63.0	52.0	56.0	20–90
Total correct ..	54.6	60.6	55.0	56.7	
Total W correct.	52.0	57.2	54.0	54.4	
Total B correct.	57.2	64.0	56.0	59.1	

Behavior in these tests indicated adequacy of motivation, and as a rule diligence of effort to choose the correct box in order to obtain the food. There were many daily series in which success exceeded chance by 20 to 40 per cent., but in no case was perfection of response achieved, even for a single daily series. The degree of success exhibited, together with the behavior of the subjects in making their choices, convince us that some cue or cues, unobservable directly by us, were operative. Among them may have appeared symbolic process representative of white box or black box. But, if this occurred, it is clear that it did not function readily and smoothly, for the subjects obviously worked very hard to adapt to a situation which for the normal human being is extremely easy, and, moreover, they often were much disturbed emotionally. It appears that, whereas the "thereness" of the correct box may readily be responded to by the chimpanzee, the "thatness"—as exemplified by a symbolic process equivalent to rectangular whiteness—is used with difficulty and uncertainty. Nevertheless, it is our opinion, based upon the results of varied and long-continued training experiments, that symbolic processes occasionally occur in the chimpanzee; that they are relatively rudimentary and ineffective; and that our experiments with subjects ranging in stage of development from early childhood to maturity have supplied no convincing evidence of the increase in frequency and functional value of symbolic response with increase in experience and age.

In our findings we consider most significant the evidence that delayed response, in the absence of spatial cues or with misleading cues, is either extremely difficult or impossible for most chimpanzees. This suggests that we may have happened upon an early phylogenetic stage in the evolution of symbolic process. There is abundant evidence that various other types of sign process than the symbolic[9] are of frequent occurrence and function effectively in the chimpanzee.

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[9] C. W. Morris, *op. cit.*, pp. 17*ff.*, and E. A. Esper, chapter 11 in "A Handbook of Social Psychology," Clark University Press, pp. 426*ff.*, 1935.

SYNTHESIS OF ASCORBIC ACID IN EXCISED ROOTS OF THE WHITE MOONFLOWER

ASCORBIC acid is of very wide-spread occurrence in the roots of plants. The site of its synthesis constitutes a problem of considerable interest. Studies with intact plants are complicated by the possibility of transport from other organs. The answer to the question as to whether or not ascorbic acid is synthesized by the roots themselves can best be obtained by studies on excised roots.

Seeds of white moonflower (*Calonyction aculeatum*) were sterilized and germinated in darkness. When the radicles had attained a length of 2 to 4 cm the tips (1.5 cm long) were excised and transferred to flasks of nutrient solution. The composition of the nutrient solution was as follows: $Ca(NO_3)_2$ 0.0006 M; KNO_3 0.0008 M; $MgSO_4$ 0.00015 M; KCl 0.00087 M; $Fe_2(SO_4)_3$ 0.000006 M; $MnSO_4$ 0.000002 M; $Na_2B_4O_7$ 0.0000023 M; glucose 2 per cent. The cultures were kept at room temperature; one half of each set was exposed to diffuse daylight throughout the culture period, whereas the other was maintained continuously in darkness.[1]

Ascorbic acid determinations were made of samples of roots grown in the culture solution and of samples of seedling roots of the size and age of the original explants. The vitamin C content of the tissues was determined by a modification of the Tillmans method.[2] A combination of 8 per cent. metaphosphoric acid in 8 per cent. acetic acid was employed in extracting the juices.

Table I presents the results of three experiments involving 20 determinations on 132 cultures. Each value

TABLE I

ASCORBIC ACID CONTENT OF EXCISED MOONFLOWER ROOTS

C content of roots similar in age and size to original explants		Cultures in dark		Cultures in light		Culture period
mg/g fresh wt.	mg/root	mg/g fresh wt.	mg/root	mg/g fresh wt.	mg/root	(wks.)
		0.0263	0.0042	0.0638	0.0158	14
0.135	0.0039	0.0322	0.0038	0.1100	0.0398	8
		0.0292	0.0039	0.0984	0.0293	8

in the table represents an average of 2 to 4 tests. The data show that roots cultured in light contained approximately 4 to 10 times the quantity of ascorbic acid in the original explants, whereas those cultured in dark-

[1] Facilities for the culture work were very generously made available by the Botany Department of the George Washington University. A detailed account of the culture technic will be published separately in Smithsonian Institution Miscellaneous Publications.

[2] R. R. Musulin and C. G. King, *Jour. Biol. Chem.*, 116: 409–413, 1936.

ness show no significant difference. Previous studies[3] with cow peas have shown that roots of plants grown with their shoots in the light contain several times as much ascorbic acid as those of plants grown in darkness.

The excised moonflower roots cultured in the light possessed a deep green color due to the presence of well-developed chloroplasts. For this reason a strict comparison can not be made between these light-grown cultures and the colorless roots of intact plants grown in the light. The excised roots grown in darkness may be more nearly comparable to the roots of intact plants, since both lack chloroplasts.

It has been observed[4] in other experiments with intact plants that roots with a relatively low content of ascorbic acid during a prolonged period of cloudy weather showed a marked increase of this substance following a day of bright sunshine.

Although the evidence is not conclusive, it seems probable that the increased quantity of ascorbic acid in the excised roots cultured in the light is due to the presence of well-developed chloroplasts. If this is true, it seems probable that the colorless roots of intact plants grown in the light do not synthesize vitamin C but receive their supply from the tops. It is planned to continue these studies, using excised roots which do not develop chlorophyll.

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A NEW MENINGOTOXOID

FOLLOWING the successful production of a toxin from gonococcus as well as a potent antitoxin against the same,[1] it was considered of interest to ascertain if similar procedures followed out with meningococcus might not also yield equally promising results. This note is merely to record briefly the method followed and the results obtained to date and is preliminary to a report to be made later.

THE METHOD

Ordinary broth having a pH of 7.7 was used. Two per cent. dextrose was added and the media distributed in quantities of 400 cc to diphtheria toxin flasks. It was seeded with an indigenous strain of meningococcus (No. 64) by planting a pellicle on the surface of the media. The culture was incubated at 37° C for 12 to 15 days until the surface growth or pellicle began to settle to the bottom of the flask. The broth culture was then filtered through Zeiss paper filters K and EK and the filtrate used for the first experiments. This filtrate was found to be so toxic that finally 3 to 4 per cent. of formaldehyde was added to it and then it was incubated at 40° C for 45 days. The toxin was then precipitated by adding 1.5 per cent. alum, the precipitate duly washed and finally dissolved by adding 4 per cent. sodium citrate. The toxoid thus obtained was used for the next series of experiments.

RESULTS

The unmodified toxin when injected into mice intravenously in quantities of 0.2 cc killed immediately; 1.0 cc injected intravenously into guinea-pigs was also lethal at once. The intradermal injection into guinea-pigs of 0.2 cc caused necrosis. This filtrate was thus observed to be of high toxicity. It also gave flocculation and precipitation reactions when tested with anti-meningococcus serum. Its antigenic properties in animals were found to be of a high grade. Repeated injections led to the development of antibodies, as proved by flocculation tests.

The filtrate treated with formaldehyde and then precipitated with alum afforded a much more satisfactory toxoid. This toxoid was much less toxic but retained all its capacity to elicit antibody formation. For instance, one month after the injection of a single dose of 1.5 of the alum-precipitated toxoid into rabbits the presence of antibodies in their sera was demonstrated.

In humans it was shown that consecutive injections of 0.5 cc, 1.0 cc and 1.5 cc of the non-precipitated toxoid or of 1.0 cc of the precipitated toxoid caused the formation of demonstrable antibodies in their sera.

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INCREASED SENSITIVITY OF HYPOPHYSECTOMIZED RATS TO RADIATION

IN a study of the metabolism of Na and K in relation to adrenal cortical physiology, we have administered radioactive isotopes of these elements to variously treated animals. We have been surprised to find that hypophysectomized animals could not tolerate these "tagged atoms" even in "physiological" doses (*i.e.*, 10 microcuries), while intact animals and adrenalectomized animals show no untoward effects from such doses.

Our attention was first called to this phenomenon in an experiment in which 10 hypophysectomized rats received approximately 10 microcuries of radioactive K and four such animals an equivalent dose of radioactive Na made up in a 1 cc isotonic solution and injected intraperitoneally. All the animals were dead within 48 hours. In a large series of normal rats to which the same dose of these radioactive isotopes had been administered, no ill effects have been observed.

We next selected ten animals which had been hypo-

[3] Mary E. Reid, *Amer. Jour. Bot.*, 25: 701–711, 1938.
[4] Unpublished data.
[1] Gonococcus toxin and antitoxin, *Zentrabl. f. Bakt., Parisitenkun., u. Infektionskr.*, I Abt. Orig. 1939, Bd. 143.

physectomized thirty days previously and which were in satisfactory condition. Five of these rats were injected intraperitoneally with 10 microcuries of radioactive P in the form of 1 cc (15 mg) of an isotonic solution of Na_2HPO_4. The remaining five were given an equivalent dose of ordinary Na_2HPO_4. Within 48 hours after the injection of the radioactive P all five of the animals were dead, while the condition of the hypophysectomized controls remained unchanged.

The hypersensitivity of hypophysectomized rats to the injection of radioactive isotopes is in marked contrast to the response of adrenalectomized animals to similar doses of radioactive material. The major part of our experimental work in adrenal cortical physiology has been on adrenalectomized animals. We have injected radioactive Na and K into approximately 200 such animals and in no instance seen evidence of hypersensitivity to these substances.

Hypophysectomized rats are also more sensitive than normal animals to x-ray irradiation. Nine rats hypophysectomized three weeks previously were given 250 roentgens; this dose is well under the lethal dose for normal animals, which is approximately 700r.*; all the animals succumbed, but the median survival period was 10.6 days, as contrasted with a survival period of less than 2 days following the injection of radioactive isotopes.

It would seem established that hypophysectomized rats are abnormally sensitive to radiation, particularly when injected with radioactive isotopes, and it is to be noted that adrenalectomized rats tolerate radioactive isotopes at dose levels invariably fatal to hypophysectomized animals.

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* The x-rays were generated by a 220 KV Maximar unit, which has been installed in the Crocker Radiation Laboratory through the generosity of the General Electric X-ray Corporation.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLE MECHANICAL THERMOREGULATOR

THE regulation of temperature in a bath by controlled cooling, rather than by the usual method of controlled heating, is not a new principle,[1] but simple apparatus designed for precise temperature control has not been available hitherto. Advantages claimed for this regulator over the customary electrical type are comparable sensitivity at lower cost, with greater dependability and simplicity.

Since a small stream of cooling water is constantly introduced into the bath, an overflow or syphon is provided to maintain the level. If desired, a small coil of copper tubing may be used to provide the necessary heat transfer between the cold stream and the bath liquid, thus permitting the use of non-aqueous bath media.

A heater is used continuously, and may be of any type: immersion, lamp, steam coil or even a gas burner placed beneath the bath, provided it furnishes a steady heat input. Customary precautions should be taken to insure adequate stirring and insulation of the bath.

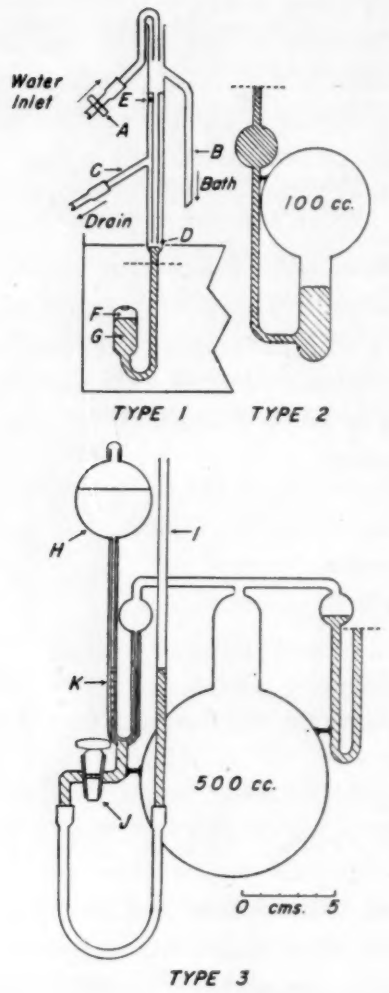
If variation in the pressure of the tap water (cooling water) prohibits the maintenance of a constant, steady stream to the regulator, a simple constant-pressure reservoir should be employed, furnishing water at one to three feet hydrostatic pressure.

The operation of the thermoregulator is self-evident from the sketch of Type 1. After bringing the bath to the desired temperature and removing excess mercury from the stem with a micropipette, if necessary, several minutes are allowed for equilibration of temperature within the regulator. Then with the mercury level below the orifice, D, in the stem, a steady stream of water is introduced into the top of the stem, its magnitude (controlled by screw-clamp, A) such that outlet C will easily handle it without overloading. Mercury is introduced into the stem from a micropipette until the orifice, D, begins to be occluded and water starts to flow into the bath through B. If the heat input to the bath is of the proper value, a steady stream of drops (or at most a thin stream of water) will hold the temperature stationary. Water must at all times be flowing simultaneously from both B and C when the bath is in equilibrium. The vent, E, prevents syphoning at C. Adjustment of the temperature to the last few hundredths of a degree may be done by varying screw-clamp A. When the bath temperature begins to fall, the regulator decreases the amount of water flowing into the bath, and *vice versa*. In permanent installations, screw-clamp A may be profitably replaced by a stopcock.

By reversing the connections at B and C, a supply of hot water entering at A will regulate the temperature of the bath through controlled heating.

Three types of bulb to be attached to the control

[1] D. F. Othmer, *Ind. and Eng. Chem., Anal. Ed.*, 3: 139, 1931; L. C. Beadle and F. A. Booth, *Nature*, 140: 279, 1937.



head are shown below the dotted horizontal lines in the sketches. Type 1 is quite compact; the expansive medium is a liquid, F, with its vapor phase, standing over mercury, G, as shown. The liquid should boil 5–10° above the bath temperature (carbon disulfide is suitable for 35–40°), and a small bubble of air is included to preserve the vapor phase. The sensitivity of this type is about ± .01°, but a 5 mm change in barometric pressure may change the temperature 0.3°.

Type 2 is filled completely with a liquid of high coefficient of expansion, *e.g.*, ethyl acetate. It is not influenced by changes in barometric pressure; the sensitivity is ± .03°, but may be improved to ± .01° by inserting metal foil or wire gauze in the bulb.[2]

Type 3 is recommended for large baths where high sensitivity (± .003°) with ease of alteration of temperature setting is desired. The setting is changed by transferring solvent in the reservoir, H, to or from the expansion bulb through a capillary (1 mm internal diameter) bend, K, which is closed by mercury from the manometer, I, during operation. The stopcock, J, which sustains the mercury column, does not leak, since it only comes in contact with mercury. For quite large baths (100 liters), the diameters of the tubing used in the control head should be multiplied by one and one-half. A rubber sleeve is slipped over the water-filled portion of the control head immersed in the bath to prevent undesirable heat loss from the bath to the stem.

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[2] R. D. Stiehler, SCIENCE, 83: 40, 1936.

USE OF LATEX DRY ADHESIVE FOR KYMOGRAPH PAPER

SURFACES that stick fast to "themselves," but to nothing else, are familiar in envelopes where a turned-down margin separates the latex-treated flaps before use. Adhesion is immediate without moistening.

In the class laboratory we have found during two years' experience much satisfaction in the use of a similar method for wrapping kymograph cylinders. The liquid preparation can be rapidly applied with a brush to a large number of sheets. These are laid out on the bench so that each projects beyond the next a half-inch or more according to the circumference of the drum used, which must of course determine the appropriate coincidence. After drying in place, the set of sheets is inverted and the opposite ends are similarly treated. Stacked flat, the sheets can not adhere; but a sheet wrapped about the drum is firmly sealed in place by mutual contact of the prepared surfaces. The latex seal resists the heat of smoking and does not loosen, yet is readily separated for clean handling of the completed record. Sheets remain adhesive after months in storage. The method not only saves time for the student, but contributes distinctly to neatness in technique.

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BOOKS RECEIVED

FREUD, SIGMUND. *Moses and Monotheism.* Pp. 218+vi. Knopf. $3.00.

GREEN, CHARLOTTE H. *Trees of the South.* Pp. xiv+551. Illustrated. University of North Carolina Press. $2.50.

HARTNACK, HUGO. *202 Common Household Pests of North America.* Pp. 319. Illustrated. Hartnack Publishing Co., Chicago.

HENDERSON, I. F. and W. D. HENDERSON. *A Dictionary of Scientific Terms.* Third edition, revised. Pp. xii+383. Van Nostrand. $7.00.

LINCOLN, FREDERICK C. *The Migration of American Birds.* Pp. xii+189. 22 figures. 12 plates. Doubleday, Doran. $4.00.

SAUNDERS, E. R. *Floral Morphology; a New Outlook with Special Reference to the Interpretation of the Gynaeceum, Vol. Two.* Pp. xiv+609+vii. 48 figures. Heffer, Cambridge, England. 10s. 6d.

SEMAT, HENRY. *Introduction to Atomic Physics.* Pp. xv+360. 147 figures. Farrar and Rinehart. $3.50.

SIMONS, LAO G. *Fabre and Mathematics, and Other Essays.* Scripta Mathematica Library, No. 4. Pp. v+101. Yeshiva College, New York. $1.00.

THOMPSON, MAURICE DE K. *Theoretical and Applied Electrochemistry.* Third edition. Pp. xxi+535. 234 figures. Macmillan. $5.00.

WALTER, HERBERT E. *Biology of the Vertebrates; a Comparative Study of Man and his Animal Allies.* Second edition, revised. Pp. xxv+882. 736 figures. Macmillan. $4.00.